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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,671	04/08/2004	Andrew Zisserman	13058N/040714	8040
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EXAMINER				
MOHR, ERIC JOHN				
ART UNIT		PAPER NUMBER		
4181				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/820,671

Applicant(s)

ZISSERMAN ET AL.

Examiner

Eric J. Mohr

Art Unit

4181

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2004.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-21 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 12 October 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date 26 August 2004
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Inventor's Patent Application
6) ☐ Other: _____

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Image and Video Indexing and Searching using Detected Objects

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the object tracking must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

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application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5, 7-8, and 11-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Jain et al (US 5,983,237).

Consider claim 1, Jain discloses a method of identifying a user-specified object contained in one or more images of a plurality of images (**see column 7, lines 10-23 where Jain describes an image searching method involving a user query**), the method comprising defining regions of objects in said images (**see column 10, lines 6-14 describing each image containing visual senses also called visual objects**), computing a vector in respect of each of said regions based on the appearance of the respective region, each said vector comprising a descriptor (**see column 10, line 16**

describing a feature vector describing a visual object), vector quantizing said descriptors into clusters **(see column 10, lines 43-47 describing grouping the feature vectors to cover a region),** storing said clusters as an index with the images in which they occur **(see column 2, line 57 to column 3, line 12 describing insertion of images and associated feature vectors into a database),** defining regions of said user-specified object **(see column 10, lines 24-26 describing computing features of a small region on an image),** computing a vector in respect of each of said regions based on the appearance of said regions, each said vector comprising a descriptor, and vector quantizing said descriptors into said clusters **(see column 11, lines 19-23 describing obtaining feature vectors for a query image),** searching said index and identifying which of said plurality of images contains said clusters so as to return the images containing said user-defined object **(see column 11, lines 24-31 describing the comparison of feature vectors and returning a ranking of image matches from a database).**

Consider claim 16, Jain discloses a method of identifying a user-specified object contained in one or more image frames of a moving picture **(see column 7, lines 10-23 where Jain describes an image searching method involving a user query, and column 9, line 64 to column 10, line 3 describing the extension of this search to video),** the method comprising associating a plurality of different 'visual aspects' with each of a plurality of respective objects in said moving picture **(see column 10, lines 6-27 describing the process of indexing images based on the features detected within that image),** retrieving the 'visual aspects' associated with said user-specified

object **(see column 11, lines 19-23 describing submitting the user query and retrieving synonymous feature vectors)**, and matching said `visual aspects` associated with said user-specified object with objects in said frames of said moving picture so as to identify instances of said user-specified object in said frames **(see column 11, lines 23-31 describing matching the synonym feature vectors with images in a database and sending back a ranking of the hits)**.

Consider claim 2, Jain discloses comparing the clusters relating to the objects contained in the images identified as containing an occurrence of said user-specified object with the one or more clusters relating to said user-specified object, and ranking said images identified as containing an occurrence of said user-specified object according to the similarity of the one or more clusters associated therewith to the cluster associated with said user-specified object **(see column 11, lines 24-31 describing the comparison of feature vectors and returning a ranking of image matches from a database)**.

Consider claim 3, Jain discloses that at least two types of viewpoint covariant regions are defined in respect of each of said images **(see column 11, lines 19-23 describing submitting the user query and retrieving equivalent query synonyms)**.

Consider claim 4, Jain discloses that a descriptor is computed in respect of each type of viewpoint covariant region **(see column 11, lines 19-23 describing that the equivalent query synonyms are represented by feature vectors)**.

Consider claim 5, Jain discloses that one or more separate clusters are formed in respect of each type of viewpoint covariant region (**see column 10, lines 43-47 describing grouping the feature vectors to cover a region**).

Consider claim 7, Jain discloses that said user-specified object is specified as a sub-part of an image (**see column 17, lines 47-53 and figure 6, describing feature spaces in an image as being disjoint regions**).

Consider claim 8, Jain discloses that identification of said user-specified object is performed by first vector quantizing the descriptor vectors in a sub-part of an image to precomputed cluster centers (**see column 10, lines 43-54 describing grouping the feature vectors to cover a region or using one large feature to cover the full feature region**).

Consider claim 11, Jain discloses that each image or portion thereof is represented by one or more cluster frequencies (**see column 8, line 66 to column 9, line 3 describing the association of a set of feature vectors to describe the visual appearance of an image**).

Consider claim 12, Jain discloses that said cluster frequency is weighted (**see column 9, lines 3-10 describing weights being associated with the sets of feature vectors**).

Consider claim 13, Jain discloses that a predetermined proportion of most frequently occurring clusters in said plurality of images are omitted from or suppressed in such index (**see column 15, line 55 to column 16, line 14 describing a diversity maximization process that limits results by using match quotas**).

Consider claim 14, Jain discloses that said index comprises an inverted file structure having an entry for each cluster which stores all occurrences of the same cluster in all of said plurality of images and possibly more precomputed information about each cluster occurrence such as for example its spatial neighbours in an image **(see column 17, line 45 to column 18, line 23 describing indexing feature vector groups by storing images together that are represented by the same feature vector cluster)**.

Consider claim 15, Jain discloses including the step of ranking said images using local image spatial coherence or global relationships of said descriptor vectors **(see column 10, lines 21-25 describing features such as orientation, shape, and turning angle histograms and column 11, lines 32-43 describing ranking the image hits based on weightings of each feature vector)**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 9-10 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain as applied to claims 1 and 16 above, and further in view of Crabtree et al (US 6,263,088).

Consider claim 9, Jain discloses the method according to claim 1, where images are grouped using any of the techniques known in Computer Vision and Pattern Recognition research at the time of invention (**see column 22, lines 30-35**). Jain does not explicitly disclose that the regions defined in each image are tracked through contiguous images and unstable regions are rejected. Crabtree discloses a correspondence graph manager which creates video tracks from regions of motion (**see column 5, lines 20-22**) and a region responder which outputs a score of the correspondence between regions of a previous frame, when this score is too low it tells the correspondence graph manager to stop tracking the current object (**column 24, lines 24-32**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Jain, and modify the region detection to include tracking of images, as taught by Crabtree, thus using a grouping technique known in the art at the time of invention, as discussed by Jain (**see column 22, lines 30-35**).

Consider claim 10, Crabtree discloses that an estimate of a descriptor for a track is computed from the descriptors throughout the track (**see column 23, lines 42-50 describing computing a mean vector from the set of data points whose cluster was matched from one frame to another**).

Consider claim 17, Jain discloses the method according to claim 16, wherein the 'visual aspects' associated with an object are obtained using any of the techniques

known in Computer Vision and Patter Recognition research at the time of invention (**see column 22, lines 30-35**). Jain does not explicitly disclose using one or more sequences or shots of a moving picture in which said object occurs. Crabtree discloses a method for breaking a video into tracks representing the motion of detected objects (**see column 2, line 65 to column 3, line 19**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Jain, and modify the feature detection to operate on video clips of specific objects, as taught by Crabtree, thus using a grouping technique known in the art at the time of invention, as discussed by Jain (**see column 22, lines 30-35**).

Consider claim 18, Jain discloses the method according to claim 16. Jain does not explicitly disclose tracking said object through a plurality of image frames in a sequence. Crabtree discloses a method tracking movement of objects through a video scene (**see column 2, line 65 to column 3, line 1**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Jain, and modify the feature detection to operate on video clips of specific objects that have been tracked through a video sequence, as taught by Crabtree, thus allowing complex objects to be tracked in an inexpensive manner, as discussed by Crabtree (**see column 2, lines 58-63**).

Consider claim 19, Crabtree discloses defining affine invariant regions of objects in said image frames and tracking one or more regions through a plurality of image frames in a sequence **(see column 18, line 59 to column 19, line 7 describing features used for image tracking, including moment invariant features)**.

Consider claim 20, Crabtree discloses that in the event that a track terminates in an image frame of a sequence, propagating the track to either following or preceding image frames in the sequence, so as to create a substantially continuous track throughout the image frames in the sequence **(see column 5, lines 20-22 describing a correspondence graph manager which creates video tracks from regions of motion and column 24, lines 24-32 describing a region corresponder which outputs a score of the correspondence between regions of a previous frame, when this score is too low it tells the correspondence graph manager to stop tracking the current object)**.

Consider claim 21, Crabtree discloses tracked regions being grouped into objects according to their common motion using constraints arising from rigid or semi-rigid object motion **(see column 25, lines 57-67 describing a split/merge resolver which uses motion features of regions to calculate confidence values between frames, thus determining whether an object is the same as the previous frame)**.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jain as applied to claim 3 above, and further in view of Schaffalitzky et al, "Multi-view matching

for unordered image sets" and Matas et al, "Robust Wide Baseline Stereo from Maximally Stable Extremal Regions".

Consider claim 6, Jain discloses the method according to claim 3, where images are grouped using any of the techniques known in Computer Vision and Pattern Recognition research at the time of invention (**see column 22, lines 30-35**). Jain does not explicitly describe using at least two types of viewpoint covariant regions including Shape Adapted and Maximally Stable regions respectively. Schaffalitzky discloses a shape adapted method to extract viewpoint covariant regions (**see page 4 describing invariant neighbourhoods**). Matas discloses a maximally stable method to extract viewpoint covariant regions (**see page 386 describing maximally stable extremal regions**).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Jain, and modify the detection of viewpoint invariant regions to use shape adapted and maximally stable regions, as taught by Schaffalitzky and Matas, thus using grouping techniques known in the art at the time of invention, as discussed by Jain (**see column 22, lines 30-35**).

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Jain et al (US 5,893,095) discloses a similarity engine for content based retrieval of images.

- b. Lim (US 6,574,378) discloses a method for indexing and retrieving images using visual keywords.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric J. Mohr whose telephone number is (571) 270-5140. The examiner can normally be reached on 7:30am-5pm M-Th, 7:30am-4pm Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nick Corsaro can be reached on (571) 272-7876. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Eric J Mohr/

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Examiner, Art Unit 4181

/Nick Corsaro/

Supervisory Patent Examiner, Art Unit 4181